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who expect to attend the International Geological Congress in the city of Mexico next September will be interested to read the paper by F. N. Guild on 'El Instituto Geologica de Mexico.' The number concludes with an interesting editorial on the consolidation of the *Geologist* with *Economic Geology*.

SOCIETIES AND ACADEMIES.

THE AMERICAN PHYSICAL SOCIETY.

A REGULAR meeting of the Physical Society was held in Fayerweather Hall, Columbia University, New York city, on Saturday, February 24, 1906. President Barus presided.

On motion the president, the secretary and E. B. Rosa were made a committee to prepare a memorial to Congress urging the passage of the pending bill providing for the use of the metric system in all the government departments.

On motion a committee was appointed consisting of A. G. Webster (chairman), M. I. Pupin and P. C. Hewitt, to consider the practicability of securing for the Physical Society an endowment fund, the income of which shall be available to meet the expense of committees appointed by the society to investigate and report on special topics of importance.

The following papers were read:

W. G. CADY: 'A Direct-recording Magnetic Declinometer.'

W. G. CADY: 'A Machine for Compounding Sine Curves.'

A. W. SMITH: 'The Damping of a Ballistic Galvanometer.' (Read by title.)

E. L. NICHOLS and ERNEST MERRITT: 'Further Experiments on the Decay of Phosphorescence in Sidot Blende.'

E. L. NICHOLS and ERNEST MERRITT: 'The Decay of Phosphorescence in a Certain Specimen of Willemite.'

E. B. ROSA: 'The Gray Absolute Electrodynamometer.'

B. B. BOLTWOOD: 'On the Relative Proportion of the Total α -ray Activity of Radioactive Minerals due to the Separate Radioactive Constituents.'

H. M. DADOURIAN: 'The Radioactivity of Thorium.'

CARL BARUS: 'Nucleation and Ionization in CO_2 and Coal Gas.'

H. T. BARNES: 'Temperature Records of Nocturnal Radiation.'

E. F. NICHOLS: 'On the Possible Separation of Electric Charges by Centrifugal Accelerations.'

The spring meeting of the society will be held in Washington.

ERNEST MERRITT,
Secretary.

THE SAN FRANCISCO SECTION OF THE AMERICAN MATHEMATICAL SOCIETY.

THE ninth regular meeting of the San Francisco Section of the American Mathematical Society was held at Stanford University, on February 24, 1906. Sixteen members of the society were in attendance; in addition to these there were present a number of high school teachers of mathematics who are not members of the society. The following papers were read and discussed during the two sessions of the section:

DR. J. H. McDONALD: 'The theory of the reduction of hyperelliptic integrals of the first kind and of genus 2 to elliptic integrals by a transformation of the n th order.'

DR. W. A. MANNING: 'On multiple transitive groups.'

MR. ARTHUR RANUM: 'A new kind of congruence-group and its application to the group of isomorphisms of any abelian group.'

PROFESSOR D. N. LEHMER: 'On the orderly listing of substitutions.'

PROFESSOR D. N. LEHMER: 'Note on the values of z of given modulus which give maximum or minimum values to the modulus of a given rational integral function of z .'

PROFESSOR R. E. ALLARDICE: 'Note on Legendre's equation.'

PROFESSOR R. E. ALLARDICE: 'On the multiple points of unicursal curves.'

PROFESSOR E. J. WILCZYNSKI: 'Outline of a projective differential geometry of curved surfaces.'

MR. E. T. BELL: 'Method of dealing with the problems connected with prime numbers.'

DR. T. M. PUTNAM: 'Theorems on perfect numbers.'

DR. J. H. McDONALD: 'A method of simultaneous approximation to two consecutive roots of an algebraic equation of degree n all whose roots are real.'

DR. J. H. McDONALD: 'Remarks on the calculation of roots of Bessel functions.'

PROFESSOR M. W. HASKELL: 'On collineations.'

PROFESSOR G. A. MILLER: 'Groups in which every subgroup of composite order is invariant, and a new chapter in trigonometry.'

PROFESSOR G. A. MILLER: 'The groups which contain exactly thirteen operators of order 2.'

The next meeting of the section will be held at the University of California, on September 29, 1906.

G. A. MILLER,
Secretary.

THE SOCIETY OF GEOHYDROLOGISTS, WASHINGTON.

THE fourth regular meeting of the society was held on February 7, the following papers being presented:

Decline of Artesian Head and Flows at Monte Vista and Denver, Colorado: C. E. SIEBENTHAL.

At Monte Vista in the San Luis basin the wells to the different aquifers show great uniformity of flow, although outside of the town the wells to the same beds vary considerably in head and discharge. There is, likewise, an averaging of temperatures in the wells in town. These inconsistencies are explained by the mingling of the waters of the different aquifers owing to faulty casing or the absence of casing below the first flow. The flow and head are both much less than when the wells were first sunk.

In the city of Denver there has been a similar decline, the head having fallen from 80 or 90 feet above the surface in 1882-3 to 140 feet below the surface in 1904, with the prospect of going still lower. The depression, however, is local, as the wells in the Platte Valley both north and south of the city still flow.

Warm Mineral Springs in the Bighorn Basin, Wyoming: C. A. FISHER.

The Bighorn Basin in northwestern Wyoming is essentially a broad structural valley formed between two large anticlinal folds, the Bighorn Mountains on the east and south and the Rocky Mountain front range on the west. Around the outer portion of the enclosed valley there are a number of minor folds which are roughly parallel to the larger uplift. These folds are crossed in several places by the larger streams draining the basin which

have cut in them deep narrow canyons. In these canyons or at their upper or lower ends hot mineral springs occur which are usually at or near the water level of the river. The largest of these is in the southern part of the basin near Thermopolis. It is situated about thirty feet above the Bighorn River near the axis of an anticline which exposes in its crest upper carboniferous rocks. The water has a temperature of 135° and the flow has been variously estimated at from 1,000 to 2,000 gallons a minute. Hot springs of a similar nature are found at the lower end of Shoshone Canyon which crosses Rattlesnake Mountain anticline in the northwest part of the basin. The springs occur at the water level of the Shoshone River and the temperature is 98°. In the northeast part of the basin where the Bighorn River crosses Sheep and Little Sheep Mountain anticlines in Black and Sheep canyons, respectively, a similar phenomenon is observed. Here the springs occur in the canyons at the level of the river. The water is warm and somewhat mineralized. The water of these springs, which is under artesian pressure, is probably derived from some of the deep-seated porous formations outcropping high on the slopes of the surrounding mountains. The high temperature of the water may be caused either by its circulation in the porous formations at great depth (not by chemical action), or possibly by contact with bodies of heated igneous rocks at considerable depths.

THE fifth regular meeting of the society was held on February 21, the following program being presented:

Underground Water in the Vicinity of El Paso, Texas: G. B. RICHARDSON.

El Paso, Texas, which is the commercial center of a large area in southwestern United States and Mexico, is located in a region where the annual rainfall is less than ten inches and the water supply a fundamental problem. The Rio Grande is the main asset, although the flow of the stream is irregular. The bed of the river has been dry for several months at a time but during floods the flow is enormous. Irrigation has been practised in

the valley below El Paso for more than three hundred years, but recently, owing to increased irrigation on the head-waters of the river, the water supply has materially diminished. Relief is expected from the proposed dam near Engle, New Mexico.

Supplementing surface water, during the past few years, pumping plants for irrigation have been in successful operation. Water is found in sand about fifteen feet beneath the flood plain of the river and the wells are commonly sunk to a depth of sixty feet where a bed of gravel is encountered. It has been supposed that the source of the underground water is the underflow of the Rio Grande, but recent tests, made at the narrows above El Paso, have established the fact that the underflow there is insignificant, amounting only to about fifty gallons a minute, the velocity of the water being less than three feet in twenty-four hours. There is, however, a close relation between the position of the water level in the valley wells and the stage of the river. Instead of the wells tapping a strong underflow, it appears that the supply is derived from water stored in sand and gravel which are replenished chiefly during periods of floods. At such times the scour of the river is strong and the cover of silt is swept away so that there is direct access of water to the underlying porous material. Except in time of floods the river deposits silt, through which little or no water seeps.

Until recently the water supply of El Paso has been derived from valley wells, but the quality of the water is poor, and since October, 1905, the city has been supplied from wells on the 'mesa' six miles northeast. In 1903 an experimental hole 2,285 feet deep was drilled there, probably all the way through unconsolidated material, in which little or no water was found below the well-known horizon between 200 and 300 feet beneath the surface. At that depth in fine sand and gravel there is an excellent quality of water under a slight artesian head, but whether the supply is equal to the demand remains to be determined. The water company has sunk about a dozen wells of ten- and twelve-inch bore from which the water is raised by com-

pressed air, petroleum being used for fuel, and the city is supplied with about one and a half million gallons a day. Tests are being made of the capacity of the plant.

Underground Water Conditions along the Lower Colorado River and Vicinity: WILLIS T. LEE.

After outfitting at Kingman on the Santa Fe railroad a trip was made northward through the Hualpai Valley to the Colorado River. Notwithstanding that water often stands for considerable periods in 'Red Lake' in the lowest part of the valley, borings have proved the non-existence of groundwaters down to 700 feet, the greatest depth yet reached, the absence being attributable to leakage into the Colorado River, which cuts the valley to a depth of about 1,400 feet. The conditions are similar in the Detrital-Sacramento valley and in the Cottonwood, Mohave and similar basins through which the river cuts.

A boat was constructed at the Colorado and towed a few miles up stream to the mouth of the Grand Canyon near the point where the river strikes the Nevada state line, from which point the banks were examined to Yuma near the Mexican boundary. The present position of this part of the river is very clearly due to superimposition, mountain ridges and basins being cut indiscriminately. An old valley, which was even deeper than the present canyon, but which was filled before the cutting of the latter, was seen at several points. A number of places were noted where dams might be erected to furnish power for mining purposes, but the height to which the river water would have to be lifted (500 and 2,000 feet) is too great to admit of the economic irrigation of the uplands. Some springs occur, but they are not of economic importance. Below Black Canyon there are considerable flood plains which might be irrigated from the river, but levees will be necessary to protect the land from the river during floods. The silts are so fine that little water can be obtained from them.

M. L. FULLER,
Secretary.

THE CHEMICAL SOCIETY OF WASHINGTON.

THE 165th meeting of the society was held in the Cosmos Club on Thursday, March 8, 1906.

Dr. Edwin A. Hill read a paper on 'The Use of Physical Properties in Confirming Stereochemical Inferences as to Molecular Structure,' illustrating his ideas by means of models. He pointed out the relation existing between the melting- and boiling-points of the *cis* and *trans* forms of stereoisomers, and showed that, in doubtful cases, this relation may be of use in supplementing chemical data as to structure. He also explained his ideas regarding the plane projection of stereochemical formulas of open and closed chain compounds, speaking especially about the paraffin hydrocarbons and the sugars.

Dr. William Frear, chairman of the standards committee of the Association of Official Agricultural Chemists, spoke of the objects and work of that committee. He stated that, in their attempts to establish standards of purity for food products, they were at first strongly opposed by the manufacturers, many of whom now endorse their work.

C. E. WATERS,
Secretary.

THE TORREY BOTANICAL CLUB.

THE club met at the museum building of the New York Botanical Garden on February 28. Vice-president Professor L. M. Underwood presided, and twenty-one persons were in attendance.

The first paper on the scientific program was by Dr. W. A. Murrill, on 'A Destructive Disease of the Chestnut Trees.' The disease in question was discovered last summer by Mr. H. W. Merckel in the New York Zoological Park, where most of the chestnut trees were found to be affected and many of them injured beyond hope of recovery. Besides being abundant about New York City, it is known to occur also in New Jersey, Maryland and Virginia, and its presence is suspected in Georgia and Alabama. The disease is apparently unknown to all our mycologists and the fungus appears to be undescribed. By cultures, inoculations and field studies, its morphology and life history have already been

quite well determined; but no treatment beyond clean culture can as yet be suggested. The paper was illustrated by specimens, photographs, drawings and cultures.

The second paper was entitled '*Cratægus* of Dutchess County, N. Y.,' by W. W. Eggleston. Many herbarium sheets were shown. The paper will appear in the April number of *Torreya*. It was briefly discussed by Professor Underwood.

The last paper, by Miss Alice A. Knox, was entitled 'A Cucurbitaceous Stem of the Desert.' *Ibervillea Sonora*, an American desert species of the Cucurbitaceæ, is noteworthy for its enormously thickened perennial stem, which frequently reaches a diameter of forty centimeters. This stem can exist an indefinite time without water, sending up yearly long flexible shoots. Its anatomy shows in general the ordinary stem structure of cucurbitaceous plants. There is a double ring of bicollateral bundles, a ring of stereome, and collenchyma in the cortex. Peculiarities of its histology are the irregular number of bundles, the absence of interfascicular cambium, and the great breadth of the medullary rays. An active cambium is found within as well as without the hadrome regions. Scattered sieve tubes occur in the periphery, and an elaborate system of secretory canals adjoins the leptome regions ramifying also through pericycle and cortex. In the older stems supernumerary leptome bundles develop, often accompanied by pitted ducts which are cut off from the primary hadrome by the renewed activity of the wood parenchyma. A large periderm gradually forms, its cells finally encrusted with calcium carbonate. It is difficult to trace the age of these tubers, as the medullary rays are not formed yearly, but judging by the increase at the base of old shoots and by the development of young plants; they may sometimes be the product of half a century of growth. The paper was illustrated by drawings and living specimens. The paper was discussed by Dr. Rydberg, who mentioned the stem characters and geographical range of *Cucurbita*.

C. STUART GAGER,
Secretary.

THE NEW YORK ACADEMY OF SCIENCES.

SECTION OF BIOLOGY.

THE January meeting was devoted to reports by members who had attended the scientific meetings at New Orleans and Ann Arbor.

At the February meeting Professor Britton presided in the absence of Vice-president Crampton. Professor F. S. Lee presented the results of his recent studies on 'Acid and Fatigue.' In previous communications to the academy the author discussed the physical phenomena of fatigue and the relation to them of lack of carbohydrate. The present paper presents the results of further researches on the causation of fatigue. The physiological action on muscle of sarcolactic acid, potassium sarco-lactate, mono-potassium phosphate, and carbon dioxide has been studied in detail. All of these substances are markedly fatiguing, their action consisting in general of a diminution of lifting power and a slowing of contraction. These substances, which are produced during muscular activity, are rightly named fatigue substances. The author believes, moreover, that fatigue in many pathological states, such as diabetes mellitus, fevers, carcinoma, anæmia, various disorders of digestion and inanition, is largely due to the pathological acids that are present and produce the so-called acid intoxication of these diseases. He finds, for example, B-oxy-butyric acid, and its salts, which are characteristic of diabetes mellitus, to be fatiguing, like the physiological acid fatigue substances. Not unfrequently in pathological, as in normal, states both lack of carbohydrate and accumulation of acid are present as factors in the causation of fatigue. This is notably so in diabetes, fevers and inanition.

Dr. B. T. Terry gave a résumé of recent work on the spirochæte of relapsing fever.

Dr. C. W. Hahn called attention to the proposed biological survey for the state of New York.

M. A. BIGELOW,
Secretary.

DISCUSSION AND CORRESPONDENCE.

A CASE OF ISOLATION WITHOUT 'BARRIERS.'

I WAS glad to see Professor J. A. Allen's article on 'barriers' in a recent number of

SCIENCE (February 23, p. 310), not only because it convinced me that we are practically upon the same standpoint, but also because it has directed my attention to a possible improvement in the expression of my views.

I have maintained¹ that in cases of a wide distribution of a species, where there are different forms (varieties) within the range, which pass into each other, no continuity of ecological (bionomic) conditions is present. The word 'continuity' apparently does not exactly express what I meant to say, and Professor Allen, in the article referred to, defines the question again, and asks whether a case, where there are no barriers of any description, and where the different conditions of the extremes of the range of the supposed species pass into each other, would fall under my definition of discontinuity of bionomic conditions. If this should be so, he believes that we understand each other.

Indeed, this is the case. As I have said in the former note, I consider this the *first step* toward complete isolation. Since I believe that species are formed gradually, by small steps, out of varieties, and that only *complete* isolation is the criterion by which it is possible to judge whether a certain form is a species or not, it necessarily follows that *complete* isolation is also attained by degrees, and the *first step* in this direction is a differentiation of external conditions within the area of an existing species. Although, in the beginning, gradual transitions are present, and although the different conditions form a continuous series from one extreme to the other, there is no *uniformity*, and I possibly should have used the latter word, instead of 'continuity.'

On account of the transitions present in such cases, isolation is not yet *complete*, and we can not distinguish *species*, but only *varieties*. But if the transitions disappear, and isolation becomes *complete*, the paramount condition is fulfilled for the distinction of *species*. In many, possibly in most cases, complete isolation is marked by more or less

¹ SCIENCE, January 12, 1906, p. 71.